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>Title: **CN1266821A: POLYALUMINIUM CHLORIDE AND CHITIN COMPOUNDED EFFICIENT FLOCCULANT AND ITS PREPARING PROCESS**

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### ABSTRACT

The present invention discloses a compounded flocculating agent of natural organic polymer and inorganic polymer and a preparing method thereof. The flocculating agent is obtained by combining polyaluminium chloride having certain degree of basicification with chitin having certain degree of deacetylation. The flocculating agent has both excellent electroneutralizing ability and highly effective bridging ability, while having no toxic problem. The preparing method is characterized in ample raw materials and simple synthesizing steps.

### CLAIMS

1. An inorganic-organic compounded polymer flocculating agent of polyaluminium chloride and natural chitin, wherein the raw materials consist of polyaluminium chloride and 0.5-5 wt% of deacetylated chitin, the degree of basicification of said polyaluminium chloride is 40-70%, the content of  $Al_2O_3$  is 8-16%, and the degree of deacetylation of the chitin is 60-80%.
2. A method for preparing the inorganic-organic compounded polymer flocculating agent according to claim 1, wherein the main material is polyaluminium chloride, and at ambient temperature or at a temperature below 60°C, under normal pressure and violent agitation, a certain amount of deacetylated chitin is introduced into the polyaluminium chloride.
3. A method according to claim 2, wherein chitin is introduced into polyaluminium chloride by two ways: (1) chitin is first dissolved into hydrochloric acid or acetic acid to form a solution with about 1% concentration, and then the said solution is introduced slowly into the polyaluminium chloride system while stirring the mixture until the solution is uniform; (2) solid deacetylated chitin is shattered and then directly added into the polyaluminium chloride system at a certain weight ratio while stirring the mixture continuously until the chitin is dissolved thoroughly.

## DESCRIPTION

### **A highly effective compounded flocculating agent of polyaluminium chloride and chitin, a preparing method thereof**

The present invention relates to a compounded polymer flocculating agent of inorganic polyaluminium chloride and natural organic chitin (PACCH) and a preparing method thereof. The present invention belongs to the technical field of water treatment.

In the treatment of industrial water, domestic water, municipal sewage and industrial sewage, coagulating technology is one of the most widely applied technologies. The coagulating technology is used to remove particulate impurities and pollutants, such as heavy metals and organics, which are adsorbed on the particulate impurities. So the coagulating technology is widely needed and is being developed continuously. Coagulating agents are the key point of the coagulating technology. According to their chemical properties, coagulating agents can be divided into two categories, which are inorganic coagulating agents and organic coagulating agents. Further they can be divided into low molecular polycoagulants and polymeric flocculating agents according to their molecule weights.

The conventional coagulating agents belong to low molecular polycoagulants, which primarily comprise aluminium-based and iron based salts, such as aluminium sulphate and iron trioxide. During their use, low molecular polycoagulants have many disadvantages such as slow reaction rate, high consumption amount and unsatisfied treatment effect of low turbidity water at low temperature. A new kind of water treatment agents, inorganic polymer flocculating agents has been representing the dominant development trend of inorganic coagulating agents since 1960's, and is tending to replace conventional inorganic salt. As the mainstream of the development of inorganic coagulating agents, inorganic polymer flocculating agents have formed into series of products gradually. Now there are many well known products of polyaluminium chloride, polyaluminium sulphate and polyiron sulphate. During the same period, organic polymer flocculating agents have been developed rapidly in the field of water treatment, and especially used in industrial fields, such as water supplying, papermaking, steel making, metallurgy and chemistry. In recent years, organic polymers

have also been developed rapidly in their kinds and producing capacities. Compared with inorganic coagulating agents, organic polymer flocculating agents have the following advantages: (1) The amount needed is small, for example, one to tens ppm of organic polymer flocculating agents can result in good flocculation, wherein the amount is equal to one of tens or hundreds of the conventional inorganic coagulating agents used for the same effect; (2) The ability of clarifying water is high, since the long chains of organic polymer molecules can bridge more particles to form bigger flocs so that they can capture fine particles in water more effectively to improve the clarifying degree; (3) The flocculating rate is fast, since they can form bigger flocs in several seconds and thus improve the rate of sedimentation, floating and dehydration of filtration greatly and reduce operation time; (4) The flocculation property of organic polymer flocculating agents is not affected easily by the factors, such as pH of water; (5) The amount of sludge is small. However, there also are two factors that limit the application of organic polymer flocculating agents in water treatment, i.e. their toxicity and cost. For example, acrylamide monomer used for the product of polyacrylamide is very harmful to the nervous system of human beings and animals, so its content should be strictly controlled. Generally, the process of preparing organic polymer flocculating agents is relatively complicated, the cost of raw materials is relatively high and the price of product is expensive. Chitin is a naturally existent organic polymer on the earth and distributes widely in the body surface of arthropod and mollusc. In recent years, chitin is applied widely in the fields of food and medicine. Chitin has no toxic problem. The amount of chitin naturally biosynthesized is near 10 billion tons each year, which is the largest amount of nitrogen-containing natural organic compound next to protein on the earth. Chitin has huge potential application values.

The object of the present invention is to provide a compounded flocculating agent by introducing natural organic polymer into polyaluminium chloride so that on one hand, it can overcome the defects of inorganic flocculating agents, and on the other hand, it doesn't decrease the relatively better ability of inorganic polymer to neutralize the negative charge on the surface of particles, and even improve it.

The raw materials are polyaluminium chloride and deacetylated chitin produced by any process.

For different water qualities, the basification degree of polyaluminium chloride and the content of deacetylated chitin can be adjusted properly.

### Example 1

An inorganic-organic compounded polymer flocculating agent was prepared by adding slowly 26.20g acetic acid solution containing 1% chitin into 30.00 g polyaluminium chloride under violent agitation. The chitin had a deacetylation degree of 75%, and a molecular weight of about 300,000, and the polyaluminium chloride contained 16.54%  $\text{Al}_2\text{O}_3$ , and had a basification degree of 60%. The adding rate was 1.0 g/min. Thus an inorganic-organic compounded polymeric flocculating agent was obtained, which had a weight ratio of organics to aluminium (O/A) of 0.10. During the preparation, the concentration of polyaluminium chloride and chitin and the adding rate of chitin can be adjusted according to practical situations to avoid the separation of floc from the system due to the addition of the chitin solution.

### Example 2

0.262 g chitin powders, which had been mechanically crushed and had an average diameter of 100 meshes or more, was added into 30.00 g polyaluminium chloride under violent agitation. The chitin had a deacetylation degree of 75% and a molecular weight of about 300,000, and the polyaluminium chloride contained 16.54%  $\text{Al}_2\text{O}_3$ , and had a basification degree of 60%. After about 2 to 3 hours, chitin is dissolved into the system completely. Thus an inorganic-organic compounded polymer flocculating agent was obtained with O/A of 0.10.

#### Comparison of water clarifying effects between the flocculating agent of the present invention and polyaluminium chloride used alone

Initial water: pH 7.5 Temperature: 20°C

	Addition amount ( $\text{Al}$ mg/L)	Turbidity of initial water (ntu)	Remaining turbidity (ntu)
Flocculating agent of the present invention	1.54	90	7.7
Polyaluminium chloride	1.54	90	32.9
Flocculating agent of the present invention	1.67	90	1.7
Polyaluminium chloride	1.67	90	9.1
Flocculating agent of the present invention	2.05	90	0.3
Polyaluminium chloride	2.05	90	3.9

From above table we can see, the water clarifying effect of the flocculating agent of the present invention is significantly better than that of polyaluminium chloride.